much the same way. Yet most of us evidently consider it unscientific to deliver a paper so that the audience can see whither the evidence is tending. Instead, the author often leads his hearers blindfolded through the various trial by-paths, and when they are thoroughly dazed and irritated by the numerous turns and blind alleys, they are at last brought into the open and told where they are—or where they ought to be! Would any one *choose* to travel from New York to San Francisco with the names blotted from every station, and a dizzying detour at every railroad center? Somehow we prefer to buy a straight ticket for San Francisco and then to follow our route on our railroad maps station by station.

And yet we write our papers as if we felt with Barrie's mother that they must be a "manzy of different things all sauced up to be unlike" the sensible, straightforward way of proving a point; as if this natural simple method of exposition would cause our fellow members to "run about flinging up their hands and crying, 'Woe is me.'" L. H. E.

REVIEWS

Taylor's Flora of the vicinity of New York*

During the quarter of a century that has elapsed since the publication by the Torrey Botanical Club of the "Preliminary catalogue of Anthophyta and Pteridophyta reported as growing spontaneously within one hundred miles of New York City,"† knowledge concerning plant distribution within this area has been greatly extended and, especially during the last few years, much of this data has been recorded in several more or less comprehensive local catalogues. The consummation of the scheme originally projected by the committee on local flora of the Torrey Botanical Club is seen in Taylor's "Flora of the vicinity of New York." The area included by the present work is the same as that covered by the preliminary catalogue. It comprises all of the states of Connecticut and New Jersey and the parts of New York and Pennsylvania within a radius of slightly more than one hundred miles from New York City. The general plan of the

* Mem. N. Y. Bot. Garden 5. vi+683 pages. 9 maps. 30 Jan. 1915.

† Pp. xviii+90. Map. New York. 1888.

book is as follows: Introduction (pp. 1–37); list of local floras of the Torrey Club range (38–45); catalogue of plants (47–651); index (652–683). From the summary it is learned that the total number of species admitted into the work, excluding waifs, is 2,651, and that of these 2,038 are native. A list (p. 32) is given of twenty-two species which appear to be endemic within the area.

The introduction is largely taken up with a discussion of phytogeographical problems. The factors which affect the distribution of the local flora are treated under two heads: edaphic and climatic. From a geological standpoint the region presents great diversity, while its floristic diversity is suggested by the fact that 281 species (list, p. 14) reach their northern and 180 species (list, p. 18) their southern limits of range here. For the purpose of the phytogeographer the area is divided into two parts: glaciated and unglaciated. The terminal moraine which separates the two extends through Long and Staten Islands, upper New Jersey, and Pennsylvania. The glaciated region is said to be typified by the large percentage of hardwood trees, the relative numerical scarcity of conifers, and the large number (595) of introduced species. A list (p. 5) is given of 165 native species which occur exclusively north of the moraine. The unglaciated region includes the coastal plain (Tertiary) in southern Long Island and New Jersey and the Piedmont Plateau (Cretaceous) in northern New Jersey and Pennsylvania. Many bog plants found elsewhere seem, so far as New Jersey is concerned, to be absent from this latter district (list, p. 4).

In discussing the coastal plain the author reasserts his conviction* that the origin and present distribution of the pine-barrens is to be explained on a geological basis. In his opinion this tract is coëxtensive with the Beacon Hill formation, an area which, according to geological evidence, has been "uninterruptedly out of water since upper Miocene times," whereas the adjoining parts of the coastal plain have been subjected to repeated submergence and emergence. The pine-barrens are therefore said to represent an area which has been isolated by

* See Torreya 12: 229–242. 1912.

geological processes and maintains a relict flora, "the antiquity of which greatly antedates any of the rest of the vegetation hereabouts, so far as permanency of position and phytogeographic isolation are concerned." Perhaps the most convincing botanical evidence introduced in support of this contention is the fact that of the 565 plants which comprise the total number of indigenous species known from the pine-barrens, 386 are true pine-barren plants; in other words, so far as New Jersey is concerned, they attain their optimum development within this area. Two species seem to be endemic to the pine-barrens, two are "practically unknown" outside of this area, and it might have been added that, according to Stone,* fifty-five have not been found elsewhere in New Jersey. The author also finds evidence favoring his isolation theory in the extra-territorial distribution of certain pine-barren plants. The occurrence in the mountains of eastern Tennessee of several typical pine-barren species is thought to have an important bearing on the question, while the northward distribution of *Schizaea pusilla* and *Aster nemoralis* is also regarded as significant.†

"If this theory is correct, then the pine-barrens can no more be considered as a new or pioneer vegetation, but rather an old or climax condition, ancestrally infinitely more ancient than anything in the surrounding area." At first thought, this statement seems quite at variance with current ecological conceptions, but such is not really the case. The New Jersey pine-barrens lie within a region whose climate is capable of supporting a highly mesophytic forest, and this type of forest represents the climax or ultimate type of vegetation throughout the area. In comparison with it the vegetation of the pine-barrens, from an ecological standpoint, must be classed as a primitive or pioneer type. But while the successional trend of vegetation throughout the east is unmistakably toward a mesophytic condition, and while the climate undoubtedly favors the development of a mesophytic forest, it must be recognized further that the actual attainment of such a climax postulates the existence of favorable edaphic conditions. Local conditions, however, such as soil

* New Jersey State Mus. Report 1910: 75.

† In this connection see Fernald, Rhodora 17: 67–69. 1915.

texture or composition and available water, may be such that a series of successional changes may be halted for an indefinite period at a point far short of the regional climax. Thus the reviewer has pointed out, in his discussion of the plant societies of Connecticut,* that along the crests of the trap ridges edaphic conditions may be such that the ultimate forest is dominated by oaks and hickories; similarly many pitch-pine forests in the Connecticut sand-plains may very likely represent the most mesophytic type of vegetation attainable under the existing soil conditions. It seems important therefore that a careful distinction be made between an edaphic climax which may be determined by local conditions, and a regional climax, which is favored by climate but can be attained only under favorable edaphic conditions. While, therefore, in a sense the vegetation of the pine-barrens is to be regarded as a primitive or pioneer type, it probably represents a remarkable example of a widespread edaphic climax, widespread because the peculiar soil conditions with which it is so intimately associated are likewise widespread.

Several pages of the introduction are devoted to a consideration of "the probable effects of the glacier on the coastal plain excluding the pine-barrens" and to the northward distribution of coastal plain plants into Staten Island and Long Island. In the latter connection it is assumed that an "avenue of migration" must have existed in post-glacial times between these areas and New Jersey, yet the necessity of assuming the existence of some such former connection between eastern Long Island and the adjacent mainland to account for the segregation in southern New England of a very considerable group of coastal plain species "seems doubtful."†

Under the head of climatic factors an attempt is made to correlate the distribution of the flora within the area treated with the length of the growing season. It is pointed out that the number of days intervening between the last killing frost of spring and the first one of autumn varies from 117–123 days in the Catskills and the mountains of Pennsylvania to 220 days at Cape May, a difference of more than three months. On an

* Torreya 14: 177. 1914.

† In this connection, see the reviewer's observations in Torreya 13: 94–99. 1913.

appended map is drawn a line, north of which every weather station record is said to show an average growing season of 153 days or less and south of which the average is 164 days or more. It should be remarked, however, that in Connecticut there are at least three stations south of this line which record averages of less than 153 days, notably the station at Voluntown where the records of twelve years seem to show an average growing season of less than 130 days. "This arbitrarily drawn line, seems to separate, roughly speaking, the northern plants from those more generally distributed."

In the mind of the reviewer it seems extremely doubtful whether, within the comparatively small area under surveillance, it is possible to correlate the distribution of plants in general with widespread climatic phenomena. It is of course not disputed that climatic factors are of primary importance in determining the geographic distribution of plants in the large. And it may indeed be possible, even within the area in question, to correlate with climate certain of the broader aspects of the vegetation, as for example variations in the nature of the climax forest on uplands.* But as affecting the distribution of plants in general, it seems impracticable, except where pronounced climatic dissimilarities, such as may be produced by considerable elevations or proximity to seacoast, are observable, to attempt to use variations in climate as a criterion. For even within a tract of but a few square miles, due to differences in slope, exposure, etc., there may exist a miniature diversity of "climates" quite as appreciable as the more wide-spread dissimilarities upon which emphasis has been laid. Moreover, where individual species of diverse habitats are concerned, physiographic factors and soil conditions are of prime importance. Within a very limited area like the one just assumed, there may thus be encountered cliffs and sand-plains, bogs and swamps, ravines and flood-plains—in other words, edaphic conditions which would tend to exert an influence on plant distribution far more profound than comparatively slight climatic differences.

Coming now to the catalogue proper, it is a pleasure to find

* See Bot. Gaz. **56**: 143–152. 1913.

included keys to genera and species, adapted from Britton and Brown's "Illustrated Flora." In matters of nomenclature and taxonomy also the author in the main has followed this work, but the taxonomic treatment of a number of families or genera has been contributed by various specialists. In treating the respective species there is given (1) the habitat, (2) the geographical range (after Britton and Brown), and (3) the "distributional trend" for the states of Connecticut and New Jersey and those parts of New York and Pennsylvania included within the range of the work. As a rule this data is followed by a statement regarding the presence or absence of the species on the different geological formations (Tertiary, Cretaceous, and "Older Formations") and its distribution with respect to the length of the growing season and elevation above sea-level. Introduced species are included in the body of the catalogue, and species reported as waifs are indicated in small type.

For Connecticut the statements regarding the distribution of various species are not always in accord with the observations of local botanists. A few of the discrepancies noted in comparing the present work with the Connecticut catalogue* are as follows. Some species are much more restricted than the author indicates, *e. g.*, *Dryopteris Goldieana*, *Picea rubens*, *Polycodium stamineum*, *Viburnum prunifolium*, and *Lobelia siphilitica;* while *Carex setacea* and *Cerastium viscosum* are not recorded at all in the Connecticut catalogue. Other species are much commoner than is indicated, *e. g.*, *Picea mariana*, *Juncus brevicaudatus*, *Blephariglottis grandiflora*, and *Sanicula trifoliata.* The distributional trends in Connecticut of *Asplenium montanum*, *Rhododendron maximum*, and *Lobelia Dortmanna* are southeastward, not northwestward; *Lonicera coerulea*, given as "increasing northwestward," is recorded only from the east; while five of the seven recorded stations for *Solidago Elliottii*, cited as "Common along the coast, decreasing and perhaps wanting inland," are in the interior. A few Connecticut records apparently have been overlooked entirely, viz., *Carex laxiflora leptonervia*, *Juncus brachycephalus*, *Trillium grandiflorum*, *Castalia tuberosa*, *Aquilegia*

* Catalogue of the flowering plants and ferns of Connecticut. Bull. State Geol. & Nat. Hist. Survey Connecticut, Bull. 14: 1–569. 1910.

canadensis flaviflora, *Oenothera grandiflora*, *Raimannia laciniata*, *Kneiffia pratensis*, *Bidens aristosa*, and *Artemisia caudata*.

Notwithstanding occasional discrepancies of the sort just noted which seem to have crept into the text, this work must be regarded as a noteworthy contribution to the phytogeographical literature of eastern North America, and one which will find a wide range of usefulness. The manner of presenting the subject matter is in some respects unique, while the attempt which has been made to correlate plant distribution with external factors and to outline the distributional trends of various species will encourage further investigation along these lines.

George E. Nichols

Kraemer's Applied and Economic Botany*

A book so ambitious in scope, attempting to appeal to such a large constituency, raises one or two questions the answers to which depend on the viewpoint more than they do on the facts of the case. Is it possible to make sufficiently intensive the treatment of any one of the subjects, which must at the same time be so presented that it will make a general appeal to all the readers to whom the book is addressed. Conversely, are the different classes of readers so diverse that any attempt to cater to all of them must end in such a general treatment, that the specific requirements of some group of specialists, chemists for instance, can not be met? The difference of motive here is obvious, and the compromise that Professor Kraemer has made of a difficult situation is, on the whole, a very satisfactory one.

The book has been divided into eight chapters, the headings to which are significant of the importance that Professor Kraemer has seen fit to give to each subject. The chapter-headings are as follows. I. Principal Groups of Plants (pp. 1–133), II. Cell-contents and Forms of Cells (pp. 134–297), III. Out and Inner Morphology of the Higher Plants (pp. 298–429), IV. Botanical

* Kraemer, H. Applied and Economic Botany: Especially adapted for the use of students in Technical Schools, Agricultural, Pharmaceutical and Medical Colleges, and also as a book of reference for chemists, food analysts and students engaged in the morphological and physiological study of plants. Ph. 1–806. fig. 1–424. (including 2 colored plates). Published by the author. For sale by M. G. Smith, 145 North Tenth Street, Philadelphia. 1914. Price $5.00.